Ch 21
Sec 21.1
HW:Sec Rev 18,19,38,39,62,75

obj: Explain how acid/base titrations are used to calculate the concentration of an acid or a base.

Acid/Base Reactions

- In general when an acid reacts w/ a base the products are water + a salt.
- These reactions are Double Displacement Rxns.

$$HCl_{(aq)} + Na(OH)_{(aq)} \longrightarrow NaCl_{(aq)} + H_2O$$

- These types of reactions are called neutralization rxns.
  * Called neutralization because the salt solution has a pH of 7.

- Strong Acids Reacting w/ Strong Bases produce Neutralization Rxns.
  * Not all Acid/Base Rxns are neutralization Rxns.

Titrations

- A process that is used to determine the concentration of an acid or base.
- Depends on the Neutralization of Acids + Bases.
  * Moles of $[H^+]$ = moles of $[OH^-]$

- Steps involved in titration
  1) A measured Volume of the Unknown Solution (Acid or Base)
  2) Add an indicator to the unknown solution.
     * The indicator needs to change color @ a pH of 7
  3) Add a Standard Solution to the unknown
     * Keep track of the amount used.

* Once the solution's pH is 7 the Volume + Molarity of the standard is used to calculate the molarity of the unknown solution.

- $M_s \times V_s$ = moles of the standard
- Moles Unknown = Moles of the Standard @ the end point. (pH = 7)

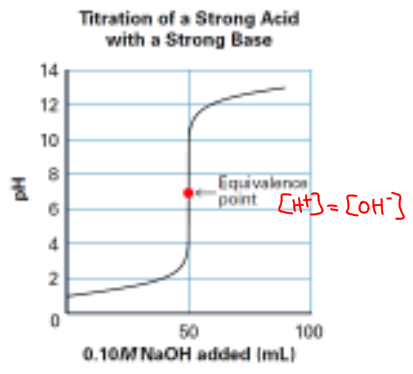
Given
50 mL HCl
20 mL 1M NaOH
Want
M of HCl

$M_s V_s = M_u V_u$

$M_u = \frac{M_s V_s}{V_u} = \frac{20\text{mL}(1M)}{50\text{mL}}$

$= .4\ mol/L$

* Works when the # of ionizable H^+ equals the # of OH^-.



- Predicting Acid/Base Products
  - * Products are always a salt and water.
  - * The salt comes the cation of the base and the anion of the acid.

$H_3PO_4 + Al(OH)_3 \rightarrow AlPO_4 + H_2O$

- In a neutralization rxn the number of H^+ always equals the # of OH^-.
  - * Can identify the number of moles of H^+ or OH^- from the concentration of the solution.
  - * $1.5 \frac{moles}{L}$ of $HCl \Rightarrow 1L$ of solution $1.5 moles of H^+$
  - * $2.0M$ of $H_2SO_4 \Rightarrow 1L$ of solution $4 moles of H^+$